REMARKS

The Applicants thank the Examiner for the careful consideration of this application. The Office Action dated July 27, 2010 has been received and its contents carefully considered. Claims 1-4, 6-24, 26-29, and 34-45 are currently pending in this application. Claims 1-4, 6-12, 20-22, 26-27, 34, 36-38, 40, and 42-43 are currently under examination. Claims 13-19, 23-24, 29, 35, 39, 41, and 44-45 are currently withdrawn in response to a previous requirement for restriction and election of species. Claims 5 and 25 have been cancelled without prejudice to the subject matter disclosed therein. Applicant expressly reserves the right to pursue the subject matter of the cancelled claims in this application or in another application. Claims 1, 11-12, 20, 22-24, 26, 29, 34-36 have been amended. The amendment to claims 1 and 34-36 is supported, for example, on page 6, lines 16-17. Claims 11-12 have been amended to correct minor informalities only. Claims 20 and 22 have been amended to depend from claim 1. The amendment to claim 26 is supported on page 78, line 19, and Examples 33-35. Claims 23-24 and 29 are amended to include the limitations of claim 26. New claims 38-43 are supported throughout the specification, for example, in original claims 2 and 11 and page 5, line 30 and page 8, line 21-page 10 line 2. Support for new claims 44-45 are found, for example, on page 78, line 18-26. Based on the foregoing amendments and the following remarks, the Applicant respectfully requests that the Examiner reconsider all outstanding rejections and that they be withdrawn.

Restriction/Election and Rejoinder

Claims 13-19, 23-24, 29, 35, 39, 41, and 44-45 are currently withdrawn from examination in response to the previous requirement for restriction and/or election of species. Claims 20-22 now depend from claim 1, and should be examined. New claims 38, 40, and 42-43 fall within groups I and III as defined in the Restriction and should also be examined. Applicants respectfully request examination of claims 1-4, 6-12, 20-22, 26-27, 34, 36-38, 40, and 42-43

Applicants respectfully request examination be expanded to include the non-elected species (M.P.E.P. § 803.02). Applicants respectfully request rejoinder of method claims that depend from, or require all the elements of, an allowable claim (M.P.E.P. § 821.04).

Specification

On page 3, the Office Action objects to the specification. The specification has been amended to include a Brief Description of the Drawings. Support for the amendment is found, for example, on page 134, line 16; page 134, line 21-22; and page 135 line 1. Applicants respectfully request the objection be withdrawn.

Claim Rejection – 35 U.S.C. § 102

On page 3, the Office Action rejects claims 1, 2, 10, 26-28, 34 and 36 under 35 U.S.C. § 102 as allegedly anticipated by Drent et al. (EP 0577205). Applicants respectfully traverse.

With respect to claim 1, Drent et al. does not teach or reasonably describe a catalyst system wherein the "acid is present in the range greater than 5:1 to 95:1 molar excess compared to said ligand" as required by amended claim 1. Drent et al. describes reactions having, for example, palladium acetate (0.5 mmol), ligand (3 mmol), and 2,4,6-timethylbenzoic acid (10 mmol). The ratio of acid to ligand is 3.33:1, which is not in the range greater than 5:1 to 95:1. Applicants respectfully request the rejection be withdrawn.

With respect to claim 26, Drent et al. does not teach or reasonably describe a reaction medium comprising ethene, as required by amended claim 26. Drent et al. describes only reactions of conjugated dienes (see abstract, and page 2, lines 1-2), which does not include ethene. Applicants respectfully request the rejection be withdrawn.

With respect to claims 38, 40 and 42, Drent et al. does not describe "a bidentate phosphine, arsine, or sibine ligand, wherein said ligand is of general formula (I)." The ligand used by Drent et al. has an alkylene (butane) bridging group (See Drent et al., page 4, lines 5-10 and page 4, line 38), and not an optionally substituted aryl moiety of Applicants' formula (I). Applicants respectfully request the rejection be withdrawn.

Claims 2, 10, 27-28, 34, 36, and 43 depend directly or indirectly from claims 1, 26, 38, 40, or 42 and are allowable for at least the same reasons. Applicants respectfully request the rejections be withdrawn.

Claim Rejection - 35 U.S.C. §103(a)

On page 4-5, the Office Action rejects claims 1-12, 26-28, 34 and 36 under 35 U.S.C. §103(a) as allegedly obvious with respect to Wang et al. (US 6,348,621) in view of Pearson et al. (WO 98/41495). Applicants respectfully traverse for at least the following two reasons.

First, with respect to claims 1, 26, 34, 36, 38, 40 and 42, one of ordinary skill would have no reason to combine the two references to arrive at the claimed invention. On page 5, the Office Action concludes that one of ordinary skill would be motivated to optimize the process described by Wang et al. by addition of excess acid. Pearson et al. acknowledges, however, "the quantity of anion (acid) present is not critical to the catalytic behaviour of the catalyst system" (see Pearson et al., page 5, lines 25-26). In the examples, Pearson et al. reports an increased yield when a 10-fold excess of acid (relative to Pd) is used, when compared with a 3-fold excess (relative to Pd) (see Pearson et al. Table 1, page 7). However, these experiments are performed with only 1:1 ratio of ligand to Pd.

Second, other references teach away from increasing both the ligand:metal ratio and the ligand:acid ratio. There is no evidence from either reference to show that there is any benefit from increasing both the ligand:metal ratio and the ligand:acid ratio to the ratios claimed in claims 1, 26, or 38, 40, or 42. In contrast, other references disclose disadvantages to increasing the ligand ratio, such as those described on pages 2, lines 20-25 of the specifiation. Likewise, other references disclose disadvantages to increasing the acid as described on page 2, lines 27-33 of the specification. Thus one of ordinary skill would be skeptical of increasing the ligand:metal ratio or the acid:ligand ratio because of these known disadvantages.

Third, the increase in reaction rate reported by Pearson et al. cannot be compared with the increase in turnover number (TON) reported in the present application. The reaction rate measures only the amount of product produced over a period of time. TON is a measure of catalyst stability

and efficiency defined as the amount of product produced over a period of time divided by the amount of catalyst consumed by decomposition over the same period. An increased reaction rate is not the same as or result in an increased TON, because the catalyst may be decomposed at a faster rate, producing a higher reaction rate, but a lower TON. Thus the reaction rate described by Pearson et al. cannot be compared with the turnover number presented in the application.

Because the reaction rate cannot be compared with the turnover number, one of ordinary skill would have no expectation of improvement by increasing both the ligand:metal ratio and the acid:ligand ratio. Given the results in Pearson et al., one of ordinary skill might foresee, or at least investigate a possible increase in reaction rate by adjusting the acid:metal ratio, but given the lack of evidence in Pearson et al., one of ordinary skill could not predict a benefit from increasing both the ligand:metal ratio and acid:ligand ratio. Based on the evidence from Pearson et al. and Wang et al., it is equally likely that the optimal ligand:metal ratio – with respect to reaction rate – is lower than 2:1 rather than greater than 2:1. And so, "optimizing" for reaction rate would not necessarily produce the claimed ratios. To conclude therefore that the claimed ratios would be produced by "optimizing" for reaction rate relies upon an improper inherency conclusion.

Fourth, there is no motivation to adjust the ligand:metal ratio and the acid:ligand ratio to optimize for turnover number because only result-effective variables can be optimized. M.P.E.P. 2144.05(II)(B). A particular parameter must first be recognized before the determination of the optimum or workable ranges might be characterized as routine experimentation. Neither Wang et al. nor Pearson et al. recognize that turnover number is a function of both the ligand:metal ratio and the acid:ligand ratio. Neither Wang et al. nor Pearson et al. recognize that the turnover number can be improved by increasing both the ligand:metal and ligand:acid ratio. In fact, Pearson et al. notes that "the quantity of anion present is not critical to the catalytic behaviour of the catalyst system" (see Pearson et al., page 5, lines 25-26). Thus, one of ordinary skill in the art would have no reason to adjust the ratios to improve turnover number, or an expectation of an improvement in turnover number by increasing both the ligand:metal and acid:ligand ratio. One of ordinary skill would not "optimize" for turnover number because it is not a recognized result-effective variable.

Finally, the claimed method produces unexpected results that are not contemplated by the combination of Wang et al. and Pearson et al. As discussed above, neither Wang et al. nor Pearson et al. describe an effect on TON, a measure of catalytic efficiency, based on the ligand:metal ratio and acid:ligand ratio. Especially in light of recognized disadvantages from high ligand:metal ratios (see page 2, lines 20-25) and high acid:metal ratios (see page 2, lines 27-33), the results are particularly unexpected. For example, Pearson et al. reports in Table 5 (page 10) a series of reactions having TON in the range of 40,000 to 88,667 with an acid:metal ratio of 20:1 and a ligand:metal ratio of 1:1. In comparison, the specification in Table 9, and Figures 1-3, reports reactions having TON over 2,000,000 (2.02×10^6), nearly two orders of magnitude higher, for reactions with the same ligand. The important difference between these two examples is the ligand:metal ratio that results in a considerable increase in the TON of the catalyst system. The claimed lower limits are reasonable in view of the surprising and unexpected enhancement in TON when both ligand:metal ratios and acid:ligand ratios are increased. This increase could not be predicted by a combination of Pearson et al. and Wang et al. Neither Wang et al. nor Pearson et al. recognize that turnover number is a function of both the ligand:metal ratio and the acid:ligand ratio, or that the turnover number can be increased by increasing both ratios. In contrast, the application provides significant evidence showing significant turnover numbers at high ligand:metal ratios and high acid:ligand ratios. Thus, the results are unexpected, and the claims are not obvious.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is hereby invited to telephone the undersigned at the number provided.

The Commissioner is authorized to charge any deficiency in any patent application processing fees pursuant to 37 CFR § 1.17, including extension of time fees pursuant to 37 CFR § 1.17(a)-(d), associated with this communication and to credit any excess payment to Deposit Account No. 22-0261.

Dated: December 27, 2010

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